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ABSTRACT

This essay assesses the principal literature published on the theory of information science during 1971-1976. This literature is compared to the article, "From Information Science to Informatics: A Terminological Investigation," by Hans Wellisch. What has been written since Wellisch wrote was found to be not equal in quality to this article, and questions he raised have not been considered by colleagues who have, until recently, also ignored the works of Soviet counterparts Mikhailov, Chernyi, and Giliarevski. The scope of writing on the theory of information science is narrow, and no progress has been made toward the goal of defining information science as a discipline or as a science. The essay provides a broad overview of the literature to encourage both increased communication and the reassessment of intellectual positions by those working in the field. (Author/KP)

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Information Science or Informatics?
A Critical Survey of Recent Literature.

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ABSTRACT

This essay assesses the principal literature published on the theory of information science during the past five years. It compares this literature to Hans Wellisch's article in The Journal of Librarianship (July, 1972). It finds that what has been written since Wellish wrote does not equal the quality of his article, that the questions he raised have unaccountably been ignored by his colleagues who until recently have also ignored the work of their Soviet counterparts: Mikhailov, Chernyi and Giliarevski. It finds that the scope of writing on the theory of IS is generally very narrow, that communication among scholars in the field is not good, and that no progress has been made toward the goal of defining IS as a discipline, much less a science. It hopes by providing a broad overview of recent efforts to encourage both increased communication and the reassessment of intellectual positions by those working in this field.

Information Science or Informatics?
A Critical Survey of Recent Literature

> "What does the North Pole look like? Christopher-Robin asked Rabbit, observing that he had known "once," but had "sort of forgotten." Rabbit replied that he'd "sort of forgotten, too," though he "did know once." Christopher Robin conjectured that "it's just a pole stuck in the ground," and Rabbit responded, "Sure to be a pole, and if it's a pole, well, I should think it would be sticking in the ground, shouldn't you, because there'd be nowhere else to stick it...The only thing it, where is it sticking?" So documentation, with all its history, richness, and connotative subtlety is now passe, and in its place we have a synthetic hybrid called information science, which as Rabbit says is sure to be a science, because of calling it a science. Moreover, it must be sticking in somebody's discipline, because there'd be nowhere else to stick it. The only think is, where is it sticking?--Jesse Chera, The Compleat Librarian, pp. 137-38

During the past five years on the pages of both the Journal of the American Society for Information Science and others in the field, there has been a battle waged over Christopher Robin's problem: is information science a science? Others questions follow if one is able to answer this basic question affirmatively. What are its theoretical premises? What are the parameters of its theory? And what will the development of a mature theory of information science do for the day-to-day practitioners of the art of information handling and manipulation? The answers to these questions will be shaped by the determination of a definition of information science which would be a major step toward answering the initial question. Hans Wellisch, in an article published in July, 1972, brilliantly illuminated the problems involved in defining information science.[1] Wellisch's article was written in the fall of 1971, during the same months in which Louis Vagrianos was writing that the prac-

titioners of information science "do not know what they are talking about and are unable to describe the product they are trying to produce."[2] One would assume that such blunt criticism would indeed touch off a battle among the "practitioners." Yet one must hesitate to call what resulted a battle. There are those who stepped forward and said there is an area that should be looked at. Others declared if one changes one's point of view in such and such a direction, perhaps new ideas will emerge. Some have offered ideas or constructs which could eventually become part of basic theory, and most recently one has suggested that since we are still where Vagrianos said we were at the end of 1971 perhaps we don't need a theory.[3] What has been written is lacking in focus and in cross fertilization of idea. Random thoughts predominate. A concerted attack is missing. Wellisch's article has not been followed up on; and it seems, therefore, misleading to think in terms of a battle. Tilting at the proverbial windmill seems to be a better description. Wellisch's colleagues have ignored most of the questions that he raised, hoping perhaps that they would fade away. His article provoked from B.C. Brookes an immediate angry and churlish reply to which I shall return later. Aside from Brookes' brief rebuttal, Wellisch's article, as far as I can determine, has been cited only once in subsequent literature.[4]

However, the points raised by Wellisch are in my judgement crucial. I shall, therefore, briefly recapitulate them and go on to summarize the principal points of some of the major articles published since then before returning to examine the rebuttal

offered by Brookes. In turn Brookes' criticism will make it necessary to look at recent Soviet contributions to the development of information science. Having done all this, it should then be possible to offer a final assessment of the overall problem.

Wellisch set for himself the task of examining the scope and aims of information science as they had been defined by the beginning of 1972. He wanted to find out if "misunderstandings and ambiguities" have been avoided so that information science may be defined as a science according to the criteria the French physicist L. Brillouin.

> Science (Brillouin wrote) begins when the meaning of words is strictly delimited. Words may be selected from the existing vocabulary or new words coined, but they are all given definition which prevents misunderstandings and ambiguities within the chapter of science where they are used.5

Wellisch concluded that information science "is primarily concerned with words and the way in which they are used to record and communicate knowledge." Consequently, he suggested that "the concepts and ideas that are basic to this science itself should be expressed and defined in the most rigorous manner--more so, maybe, than in any other science." [6]

Turning to an examination of the "concepts and ideas," Wellisch found not rigor but chaos. A study of thirty-nine different definitions of information science which appeared in the professional literature between 1959 and 1972 revealed a total of 109 different terms had been used in attempts to describe the "concepts and ideas" of the field. Moreover, these terms were spread very broadly throughout the definitions. There appeared to be no consensus on which terms were the most appropriate. Sixty-four and two-tenths per-cent of them were used in only one or two of the thirty-nine

definitions. When Wellisch combined terms in order to attempt to eliminate synonyms and identify concepts--two different words could be used to portray the same concept--he found that 56.8 per-cent of a total of eighty-one combined terms had been used only once or twice. Working on the other end of the spectrum, Wellisch found that of the 39 definitions only two terms "dissemination" and "linguistics" were used in as many as one-fifth of the total. Sixteen per-cent shared the term "flow" and 13 per-cent shared "processing" and "communications." Only three definitions shared "all five top terms" and two of them "explicitly or implicitly" refer to the first as the source of their ideas "adding or reformulating only a few terms of their own."[7]

Having dispensed with his analysis of the language of these definitions, Wellisch moved on to the question of the nature of information science. Was it a science in its own right or was it more like area-studies--inter disciplinary in nature? He noted that seventeen definitions view it as interdisciplinary, while eighteen viewed information science "as a science, sui generis." Of course, eighteen and seventeen add up to only thirty-five. Wellisch, in pointing out another aspect--the remarkable lack of agreement on the nature of information science, did not tell his readers what happened to the remaining four of his total of thirty-nine definitions. But this does not seem to me to mar an otherwise strong analysis.[8]

In his attempt to assess the nature of information science Wellisch offered an alternative approach. If information science as a discipline had not been defined, perhaps one could gain insight by asking information scientists if they agreed on a def-

inition of the realm of the subject of their study. In other words, could agreement as to the meaning of the word "information" be found in the thirty-nine definitions. The answer again was no.

> The most amazing result of this comparative study of 39 definitions of IS is the fact that only eight of them find it necessary to define what they mean by information. All the remainder rest unashamedly in circular definitions, which would be thrown out in an introductory course on logic at the undergraduate level following the pattern "Information Science investigates information." [9]

Wellisch went on to scrutinize the eight definitions that were offered and found that they did not "arrive at an agreed-upon definition," nor did "their definitions have any common elements." He concluded that "an operational definition of information as the central topic of IS should be formulated and promulgated by international bodies concerned with information activities, such as UNESCO, FID or UNISIST."[10]

Since Wellisch's article was written, the flow of articles attempting to portray or delimit a theory of information science has continued. If one measures the age of IS by the date of the earliest appearance of this term in the professional literature of documentation, IS was about eleven years old when Wellisch wrote. It is now fifteen. One might have hoped for substantial progress in dealing with the issues Wellisch raised. Such hope, it seems, has been in vain.

I

It will be worthwhile to start this survey with two articles published shortly before Wellisch's. In a paper which appeared in the summer of 1971 Glynn Harmon came out on the side of those who would view information science as a metascience overlapping existing disciplines and having the potential to unify them. He cited with approval Tosio Kitagawa's 1969 definition which estab-

lished "five indispensable research branches" of information science. Kitagawa gave each branch from six to ten subdivisions winding up with a "science" that studied or embraced no less than thirty-eight different areas or items of knowledge. His information scientist would study eight aspects of "physical information phenomena," ten aspects of "information systems analysis existence" and no less than eight aspects of the "artificial realization of information phenomena."[11]

Kitagawa's definition is the prime example of a major problem pointed out by Wellisch who complained of the "misguided efforts of those who draw in all possible (and some impossible) disciplines and applications in order to clarify what they mean by IS, or to bolster their claim that it is, indeed, a science."[12] Certainly if one accepts Brillouin's understanding of science, Kitagawa's mammoth effort does nothing to establish any "scientific" claims for information science. Kitagawa, after all, is one of those who does not feel it necessary to go so far as to define what he means by information, and the scope that he defines for his subject is so broad as to be almost meaningless. All in all, it would seem that anything which could be given this broad a definitional spread would have to be seen not as theory but rather as a series of skills that may be practically applied to specific problems, much in the same way as a doctor uses a broad range of interdisciplinary knowledge to treat a patient. We call a doctor a practitioner, not a medical scientist--a theme to which this paper shall return.

Having dispensed with a summary of recent definitions, none

of which he bothered to analyse or to criticise, Harmon moved on to attempt to evaluate the place of information science within the paradigm for the development of a science which he had elaborated in his doctoral dissertation that was later published as a book length study: Human Memory and Knowledge: A Systems Approach.[13] He suggested information science might be the third and final state of development of what began as documentation in 1895. Without himself having bothered to define information science, he declared the era of the generalist over and hailed the beginning of specialized sub fields of information science. Then suddenly he shifted his point of view and presented the reader with an alternative hypothesis: that information science may be still in the second or unified phase of documentation. In his conclusion Harmon offered a synthesis of these two positions: "Its unified growth appears to be ending and fundamental branches are emerging."[14] It seems to me that the one possible application of his paradigm to information science that he did not make--that is an analysis of it as a totally new and emerging discipline in its first and formative stage of development--is the one which would show the reader how very much further information science does have to grow before it could be considered a science.

In his article which appeared in Library Journal in January, 1972 Louis Vagrianos performed the useful task of grouping studies on the "theory" of information science according to points of agreement among their authors. He brought into focus the existence of four distinct points of view among information scientists. First was the view that information science is a science which was being formulated by the application of an interdisciplinary approach to a

subject matter of broad and varied nature. "It is research oriented with pure and applied science components." Second, there were those who see "information science as a theoretical science explaining the basis of some existing discipline, one which stands in relation to that discipline as physics does to engineering." In other words information science comprises those theoretical principles and the additional continued research effort "necessary to support the profession of librarianship." "The third group consists of those who see information science as a meta-science of some existing disciplines, their potential unifying theory." Harmon is certainly a member of this group as is to some extent the Soviet scholar E. P. Semeniuk whose views will be discussed below. Finally, there were "those who see information science as an information technology which produces a learned profession. This group would compare information science to a profession such as medicine and argue that a learned profession is not a science."[15] Information science is a discipline which "applies rather than creates basic research."[16] This final view of information science as a discipline which, while it is practiced, holds no claims to being a theoretical science is one which has already been suggested,[17] and one which will appear again in this survey.

In the May-June, 1973 issue of JASIS Gerald Salton published a brief paper in which he compared the Cumulative Index to the Annual Review of Information Science and Technology and Ingetrant Dahlberg's Literatur zen den Informationswissenschaften which appeared as part of a three-volume series entitled Das Informationsbanken-system. He used the author index both to establish a list of consensus authors (those with the highest citation frequency) for

information science in 1972. A comparison with a list of consensus authors for 1962 revealed that not one of the thirteen most heavily cited authors in that year ranked among the thirteen most heavily cited authors ten years later.

The fact that in ten years there appears to have been--by this measure at least--a complete turnover of the leading scholars in the field buttresses the conclusion that any "science" of information is still in its very early experimental stages. If any of the 1962 consensus authors had made a major unifying contribution to the theory of information science, it would seem reasonable to conclude that such an "Einstein" would also have been found on the 1972 list of consensus authors. The fact that this was not the case would seem to provide ammunition for those who suggest that information science is not yet a science, since it cannot yet give any evidence of a body of theory on which there is any consensus of agreement. As Salton remarked:

> Maybe a chicken and egg situation exists. The absence of basic theories and the largely experimental nature of the information science field hampers developments and may be responsible for the lack for first-rate researchers in the field; on the other hand, acceptable theories might exist if we had initially been able to attract a substantial number of excellent researchers.[18]

Salton's hypothesis seems to be basically reasonable but his alternative conclusion (failure to attract excellent researchers), it seems to me can be criticized. How would the consensus authors of 1972 react to the implication that they were not "excellent researchers?" Again what has been missing is not a substantial number of excellent researchers" but rather an Einstein or a Newton.

In a paper published in the very next issue of JASIS, Susan Artandi pointed out that while information "can be scientifically

studied, analyzed and controlled for its improved utilization," we "know relatively little about information as a concept and, with the exception of the extensive work in the field of mathematical information theory (Shannon et al.) very few studies exist relating to information in other concepts."[19] Artandi did not embrace the larger issue of a theory of information science and the justifiability of its claim to be a "science." What she did do was to give careful anylytical attention to the question of just what the information scientist understands by information, a question which Wellisch had pointed out as being in need of clarification.[20] Having pointed out the need to consider information on the respective levels of syntactics, semantics, and pragmatics, she discussed Doede Nauta's definition of information and pointed out what she considered to be its major weakness. Nauta considered information to be that which reduced uncertainty. Artandi wrote" "this . . . implies that information which is not new or not relevant to the individual is not information." Her choice of words confuses. If she would substitute "sense impressions" for the first "information" and change "is" to "are" her criticism of Nauta would evaporate. Finally, she concluded that while Shannon's theory of information measure could a "a useful conceptual basis for extended thinking about information problems in general . . . there seems to be some question about how far one can go in textnding this theory outside of the context of the engineering aspects of signal transmission."[21] Further research into the areas of semiotics

and the semantic, syntactic and pragmatic aspects of information was advised.

While Artandi here did not concern herself with anything related to a general theory of information science, she has made some extremely lucid remarks in the introductory chapter of her Computers in Information Science. Here Artandi admitted that:

> One of the reasons it so difficult to define the field is that information science frequently deals with things that are qualitatively not too different from contemporary librarianship and that represent the continuation of a single line of development. In other words, in information science we are often concerned with problems that are qualitatively the same as library problems at the same level except that we are considering them with more sophistication in order to cope with and utilize changes which have occurred in the environment in which we now need to operate.22

As Wellisch pointed out, when certain aspects of library science became more refined, they gave rise to documentation just as information science may properly be seen as a similar refinement of documentation.[23] So while what information science is, still remains to be clarified, Artandi was able to answer very well what it does.

> It seeks to find answers to such questions as: What is information and what is its relationship to knowledge? How is information transferred? What is the value of information and what are some behavorial patterns that relate to the use of information? How much information can be processed and tolerated by an individual.24

I would doubt that a clearer more concise definition of what in-

formation science does is to be found in the professional literature. Again the image of a learned profession that practices certain skills may be seen. Like the physician, information science seeks to diagnose certain problems and provide answers to them. There are techniques like citation analysis and the application of Bradford's law of scatter to certain problems in bibliometrics. But these techniques are borrowed from fields like mathematics, statistics and linguistics. Trying to imply that they form any kind of unique body of theoretical knowledge would seem to be merely another exercise in the making of the proverbial Procustrian bed.

In June of 1974 W. L. Saunders published a paper, "The Nature of Information Science," in which he made a number of very sensible points. Theory, he remarked, should never be confused with practice. Information science should be compared with medicine which is "both art and applied science," but while "the doctor--the practitioner--has never called himself a 'medical scientist,'" the "practitioner of information work, unfortunately, has quite often come to think of himself as an information scientist."[25] Saunders went on to reject the "curious impression that the only route to scientific respectabiliy is via the pure sciences; that to qualify as a valid science calls for emancipation from the imprecision of the social sciences. . . . Information science, in fact, embraces aspects of both."[26] He then pointed out that the social science elements were, in his opinion, the dominant ones.[27] Non-scientific aspects were the central concern of the "science." As Saunders expressed it: "If we are concerned with human communication--and surely this is our central concern--then we are con-

cerned with subjectivity, with value systems, however much some scientists may flinch at the very mention of such terms."[28]

While claiming to take "information science seriously as a science," Victor Rosenberg in an article published in the July-August 1974 issue of JASIS offered an argument that took up essentially where Saunders' paper left off--the crux of information science is to be found in human communication, not in the study of machine processes.[29] Rosenberg made clear that he was thoroughly disenchanted with the influence of "the great god Computer" on information science.[30] The computer had "become more than a tool or machine, it was a way of looking at the world. . . .and (had) caused us to view human information processing as analogous to machine processing."[31] The way information is processed and manipulated by computers had created an artificial and misshapen paradigm for information science in that one might suppose that "human behavior can be perfectly replicated by computers" when this is not the case. To put it another way: "the computer carries with it a set of values-- scientific values. These values are basically deterministic, reductionist and mechanical. The paradigm specifically inhibits serious consideration of concepts that are social, cultural or spiritual."[32] The computer far too often has been used for purposes which dehumanize man. We ought to escape from the arrogance of those scientifists who have by the definition of their training a monopoly on truth. Consequently, in the future development of information science, "we must get out from behind the computer. . . . We must begin to pay more attention to the social, cultural and spiritual aspects of human communication." He concluded that to "deal effectively with the transcendent values

of human communication we must admit as . . . evidence the intuitive, the subjective, and the experiential."[33] Rosenberg had written "scientific evidence" and one must wonder if he did this in obeisance to his earlier claim to take "information science seriously as a science." For whether we read "scientific evidence" or just plain "evidence," he was saying the same thing that Saunders had said: that the only kind of science that can be seen in the present or suggested future "scientific premises" of information sciences is social science. It is interesting to note that Rosenberg's cry to "get out from behind the computer" is reminiscent of the cry of those (Maslow et al.) who went on to formulate a humanist psychology in order to get out from behind behaviorism.

In the January-February 1975 issue of JASIS, James Williams and Chai Kim published a paper which, although ostensibly responding to Artandi's paper, "Information Concepts and Their Utility" and an unpublished paper by Lawrence Heilprin, brought the argument full-circle, traveling all the way back to Salton's chicken-and-the-egg argument. The authors used Heilprin's remarks on "the absence of a theory-based definition of information science" as a springboard to take off on a lengthy discussion of the nature and functions of scientific theory, forms of theory presentation, theory validation and types of theories.[34] Finally, they made the following statement and demand:

> The information science literature makes reference to a series of laws such as Bradford's law and Zipf's law. What is the general theory that either gives rise to these laws or has been derived from them? No one seems to be concerned about finding answers to this question. By scanning the major literature sources of information science, one can be easily convinced that the theoretical aspects of information science have been dealt with only to a very limited extent.[35]

One ought not be so "easily convinced." Surely the authors have read Wellish's article and are familiar with his lengthy bibliography? Surely they are familiar with the five-hundred-page-long volume Information Science Search for Identity published in 1974 in which the majority of the papers wrestle fanatically with the question of a theory of information science?[36]

It is true that there is as yet no theory of information science. If this is a discipline susceptible to the influence of a Newton or an Einstein, one has yet to appear. But this does not mean men such as Fairthorne, Heilprin and Kochen have given up their attempts to achieve a theoretical breakthrough. However, what this paper suggests is that a growing number of their colleagues think they have been pursuing a goal that provoked Williams and Kim when they concluded that

> Information science is at present a practice oriented discipline that has for a long period of time neglected to emphasize theory and as a result faces possible stagnation. Theory development can provide information science with new life that technology alone will never provide.37

Information science, as we have seen above, is practice oriented. A scientific discipline it is not, and whether or not it faces "possible stagnation" has not really been demonstrated by the authors.

In the final paper to be surveyed before returning to Wellisch and the question of informatics, Vladimir Slamecka was even more pessimistic than Williams and Kim had been on the question of theory development. Furthermore, as if to emphasize the continuing lack of consensus on the nature and practice of information science, Slamecka went on to advocate a course of future action directly opposite to that proposed by

Williams and Kim. He was clearly convinced that information science can become a science. However, he deplored the "impatient desire" of information scientists "to convince themselves that a new basic discipline does indeed exist," because the "development of fundamental theories of information phenomena is likely to proceed slowly even after it is decided where and who to look for the discovery of such theories." [38] It was Slamecka's basic thesis that basic "research information science proper, (had) been both motivated and largely supported" by the applied objective of "the improvement in the control of, and access to, the scientific literature" as the U.S. struggled to overtake the Soviet lead in space exploration and build what he called "a strong scientific establishment." But "societal goals" have recently changed and they now favor those "scientific fields which promise more immediate benefits and which are also willing to assess their possible negative consequences." [39]

> Information scientists again need to find a relatively concrete realistic framework within which they can demonstrate the social utility and necessity of their work to those other than their peers. . . . The crucial question is the following: Does there exist, or is there in the offing, a new national problem domain which is hospitable to the information science theoretician? The answer is clearly an affirmative one. . . .: the management of man's knowledge as a social and national resource."[40]

"The management of man's knowledge as a social and national resource" is a very fuzzy statement, one which Slamecka nowhere defined. Instead he acted as if a barrage of words thrown at the reader might make things clearer. For he lamented not only the absence of "understanding" but also the absence of "theories" of "policies" and of "strategies" for "guiding in some socially

and nationally optimal, as well as cost effective manner, the production and consumption of knowledge as a key resource of man."[41] How to do all this? Summon the great god Computer! Professor Slamecka undoubtedly has a point--somewhere. But ought not the country's political leadership to which he would have the masters of the computer appeal start with the far more basic waste of human talent that is to be found in the thousands of new and not so new Ph.D.s in the social sciences as well as the sciences who are unable to find employment? If major changes in the social priorities of this country could be brought about and historians, philosophers, mathematicians, chemists, physicists, political scientists and their colleagues in other professions could be taken off the unemployment and welfare rolls and put to work in the professions for which they have been trained, this country could harness the power of solar energy, clean up its cities and do countless other things whch would in the process keep many computers and programmers busy. Then the tremendous reserves of knowledge that are now being wasted would be used and there would be no need for Slamecka to speak of the "optimal husbandry" of knowledge--whatever <u>that</u> means.[42] Certainly there is a point to Slamecka's essay: monetary support for theoretical research totally divorced from practical application cannot be indefinitely maintained. It is when he tried to go beyond this specific point to suggest a definite path for the development of information science that he became, like most of his predecessors, lost in the shadows on the walls of the Platonic cave.

The nine papers just reviewed have little in common except that they bemoan the practice of a discipline that is called a

science but has clearly not yet demonstrated scientific characteristics. They want to be practitioners of a discipline that is founded on a unified, coherent theory, a theory that was just as elusive when Slamecka's article was published at the end of 1975 as it had been when Harmon's piece came out in the summer or 1971. Except for Jones' article all those published after Wellisch unaccountably ignore the problems he raised and again, except for Jones, all ignore the question of use of the term informatics to define their discipline. All except Vagrianos and Saunders feel that it either is, or has the potential to become, at least in part, a pure science and as we have seen above, Shannon's theory is generally the piece d' resistance that is offered up to demonstrate the "scientific" nature of information science.

II

Wellisch's article did evoke an immediate and very angry outburst from B. C. Brookes. One wonders if the fact that Wellisch's ideas have been largely ignored by his colleagues would indicate their tacit agreement with Brookes?

Brookes at any rate was quite clearly angered, and in his anger he failed to make much sense. He began with the statement that he was "sorry" to see such a "perverse" paper published, suggesting that information science could only become a science if it learned to separate itself "as completely as possible from the medieval scholasticism which, it seems, librarians mistake for scholarship." Wellisch's paper contains content analysis of a very high order. One must assume it is this that Brookes equated with medieval scholasticism and one can only ask in bewilderment, since when could content analysis no longer be considered scholar-

ship? Brookes went on to admit that while in an earlier publication he shared "Wellisch's doubts about information science," he had just persuaded the University of London to set up an M.Sc. in Information Science with the explicit object of developing the subject as a science" and therefore he has "to challenge Wellisch's conclusions." This is a strange kind of mental gymnastics where it seems as though Brookes has shifted his own intellectual viewpoint in order to avoid being in the embarrassing position of having persuaded the University of London to grant a graduate degree in a non-discipline. For it is not clear how Wellisch's conclusions may be discarded when his doubts are shared. It seems that his doubt lead quite directly to his conclusions. I cannot agree with Brookes' assertion that "Wellisch is demanding instant science and Newtons by the dozen." He was only exposing the groundless pretense of some information scientists who are claiming to be practitioners of pure science. His conclusion was that "instant science and Newtons by the dozen" had yet to appear. Another item which outraged Brookes was that, according to Wellisch, "a unified and logically sound terminology" was a"prerequisite" to "the emergence of a true science of information." Brookes maintained that a unified terminology was not a necessary prerequisite for the undertaking of scientific experimentation and cited the experiments of Faraday in the area of electro-chemical decomposition to prove his point. Yet Brooke's own example was one where Faraday busily coined neologisms to describe what had happened.[43] Faraday was only doing what Brillouin said one must do in order to develop a science.[44] What Wellisch was saying and what Brookes seemed unable to comprehend was that people who claimed to be practitioners of a science should attempt to describe with some

precision and uniformity those phenomena that they do observe. They should do their best to define what it is that they are doing and they should not run off on independent courses of development forever. For until they could begin to agree on some underlying, unifying points of theory, they did not deserve the appellation of scientists.

Finally Brookes concluded with his own definition of information science: "Information science is the scientific study of information phenomena." He went on to remark that Wellisch would dismiss his definition as circular. One must agree with Brookes: his definition is circular. Information studies information. To clarify the ambiguities of what is really a non-definition one must ask him to define "information phenomena" as well as to state what he means by "scientific study." Just how do you do the one to the other? Though Brookes admitted could not define information, he concluded that he could measure it by Shannon's theory which he predicted would become a theoretical "cornerstone of the new science."[45]

However, according to a 1971 paper by the Russian scholar E.P. Semeniuk, that is just the problem: Shannon's theory is a theory of measurement which wholly ignores the question of what information is. "Information content and meaning, information usefulness and value" are questions irrelevant to Shannon's theory. Semeniuk noted that some asserted the "Shannon's theory had laid a solid foundation for the science of information, and the problem consists in building the top floors of the building--the semantic and pragmatic theories of information--on this foundation. However this is not so." For such theories never define information.[46]

(This is essentially the same paradigm that Artandi explored with similar conclusions in her 1973 paper discussed above.)

Semeniuk went on to assert that "Shannon's theory does not investigate information as such but information quantity."[47]

> As we shall see, a paradoxical situation has developed: in information theory the concept of information itself turns out to be unnecessary; it is possible to get along without it!. . . . Shannon's theory is frequently called information theory; however, this name is not justifiable since it pertains to. . . .only the optimal methods of information coding and transmission over communication channels. . . . No one essentially would object if the stricter name of "information measurement theory" were used in place of "information theory". . . . All of this indicates that Shannon's theory cannot be considered (to be) the general science of information as a whole but even the foundation on which this science is based. It is necessary to note that Shannon himself did not state this broad problem. His research is of a narrower more deeply specialized nature; profoundly conscious of this, he especially warned against broad interpretation of the results and possibilities of his theory.48

In other words the theory which Brookes would propose as a "basic cornerstone" of information science is one which never found it necessary to develop any understanding of what was meant by information itself.

Later on in the same paper Semeniuk turned to the question of the maturation of "informatics"[49] into an independent scientific discipline. He concluded that

> many young disciplines at first have no specific method of study: they make broad use of the methods of other sciences and only gradually develop their own methods different from those already known; for example, informatics is in this situation. Thus, the absence of specific methods of study must now be considered as an argument against the independence of the science of information.50

This is a conclusion similar to the conclusion of most of the essays that have been surveyed in this paper and in mentioning "informatics" it brings us back to the final major point of Wellisch's paper--

his discussion of informatics.

While it is certainly true that papers written before Wellisch's essay and those written after have engaged to a great extent in confused argumentation over the question of whether or not information science is a science, the name itself has been accepted with little or no criticism. Wellisch pointed out in 1972 that there had recently been many attempts "to propose or suggest alternative names for IS," none of which had gained acceptance. "The only successful attempt at a new terminology was made by the Russian information specialist Mikhailov, Chernyi and Giliarevski who jointly proposed the term "Informatics" in a paper published in Russian in 1966."[51]

In a 1969 paper the same three authors defined informatics as the study of "the scientific information process in all its complexity." Its task was to increase "the efficiency of communication between scientists." [52] Its subject matter was to be the "processes, methods and laws related to the recording, analytical-synthetical processing, storage, retrieval and dissemination of scientific (scholarly) information but not the scientific information as such which is the attribute of a respective science or discipline." The authors next took great care to set sharp boundaries for this subject matter pointing out that informatics was "not concerned either with the determination of the truth or falsehood of information, nor its novelty and usefulness."[53]

> Nor is informatics concerned with the logical processing of existing information with the purpose of obtaining new information not contained. . .in the initial information. Evidently, such logical processing of scientific information, as well as the evaluation of its quality,

> is impossible unless facts, laws, and the theory of the science of which it belongs are utilized. If we consider these tasks as lying within the scope of informatics, we would have a necessity been been compelled to declare informatics a science of sciences which is, of course, absurd. It follows from the above definition of the subject area or scope of informatics that the latter belongs to the category of social sciences, since the object of its study -- that is, scientific information acticitive -- is a phenomenon peculiar to and occurring only in human society.[54]

The authors then went on to demonstrate convincingly that informatics was closely related to but not in any sense a part of semiotics, psychology and library science. [55]

One wonders whether or not if their British and American colleagues had in the 1970s come to grips with these very questions as posed by Mikhailov, Chernyi and Giliarevski, the articles reviewed earlier in this essay would have been written in anything like their present form. One wonders how Kitagawa and other advocates of information science as a meta-science would rebut these views. One also wonders why the papers published in the FID 435 volume have received so little notice. D.J. Foskett discussed the volume in a paper that he published in December of 1970. [56] Wellisch cited several of the papers contained in the volume in his bibliography [57] and then, as far as I can determine, the volume disappeared from the literature until early in 1975 it was given prominent mention in a paper published in JASIS by Nicholas Belkin. [58]

It should be clear from this essay that in the nearly four years which have passed since the publication of Wellisch's paper, information scientists have made little or perhaps even no progress in dealing with the issues that he raised. Circular definitions have led to arguments that are circular. Everyone talks, few listen and the goal of defining information science, much less elaborating a theory for it, remains elusive. However, in view of the

publication of Belkin's article one can begin to hope that the views of Mikhailov, Chernyi, Giliarevski and other advocates of informatics will now receive wider attention.

Toward the end of his article Wellisch observed that:

> it would certainly be a sign of intellectual integrity and humility if writers in the field would henceforth refer to it simply as informatics, thereby refraining from claiming a status that is not yet theirs. . . . .Informaticians will earn the respect of scientists and other users of information alike only if they will do a better job of providing them with information, "timely, efficiently and in suitable forms" to quote Mikhailov. . . . Whether theories and laws will emerge in the years to come, and justify the status of a science for informatics, remains to be resolved in the future.59

This will remain as true in the summer of 1976 as it was in the summer of 1972.

Footnotes

1. Hans Wellisch "From Information Science to Informatics: a terminological investigation," Journal of Librarianship, Vol. 4, No. 3 (July, 1972) 157-187.

2. Louis Vagrianos, "Information Science: A House Built on Sand," Library Journal, January 15, 1972, p. 155.

3. Vladimir Slamecka, "Pragmatic Observations on Theoretical Research in Information Science," Journal of the American Society for Information Science, Vol. 26, No. 6 (November-December, 1975) 318-20.

4. The citation (a brief one focusing on Wellisch's definition of informatics) occurred in a paper by Kevin P. Jones, "Towards Informatics 2" Aslib Proceedings, Vol. 25, No. 12 (1973), 491.

5. Wellisch, "From Information Science," p. 158.

6. Ibid.

7. Ibid., pp. 164-65.

8. Ibid., p. 167.

9. Ibid., p. 171 I found it necessary to insert (remainder) to make the text make sence.

10. Ibid., p. 171 and 176.

11. Glynn Harmon, "On the Evolution of Information Science," Journal of the American Society for Information Science, Vol. 22, No. 4 (July-August, 1971), 238.

12. Wellisch, "From Information Science," p. 166. On the same page Wellisch dismissed Kitagawa's definition with the following tongue-in-cheek remark: "one definition in particular goes beyond anything produced by the other pretenders to the corwn of super-scientists (assuming that whoever is an active practitioner of a super-science must, ipso facto, become a super-scientist)."

13. Glynn Harmon, Human Memory and Knowledge: A Systems Approach, Westport: Greenwood Press, 1973. Harmon's monograph is an interesting essay in the sociology of knowledge, which, though it is obviously not scientifically precise, offers an interesting and persuasive paradigm from which to view the development of scientific disciplines.

14. Harmon, "On the Evolution," pp. 239-40.

15. Vagrianos, "Information Science," p. 155

16. Ibid., p. 157.

36. Anthony Debons (editor), Information Science Search for Identity, New York: Marcel Dekker Inc. 1974. This is a collection of papers presented during the NATO Advanced Study Institute in Information Science in August 1972.

37. Williams and Kim, "Theory Development," p. 8.

38. Slamecka, "Pragmatic Observations," p. 318. B.C. Vickery (in an article entitled "Academic Research in Library and Information Studies," Journal of Librarianship Vol. 7, No. 3)July, 1975), 155, 157) offered a similar conclusion in speaking of IS: "the science is still embryonic and considerable boundary problems have yet to be settled." He also observed tnat we are still seeking "a firm theoretical basis for information science."

39. Ibid. p. 319.

40. Ibid.

41. Ibid., p. 320.

42. Ibid.

43. B.C. Brookes, "Correspondence: From Information Science to Informatics," Journal of Librarianship Vol. 4, No. 4 (October, 1972) 272-73.

44. Wellisch, "From Information Science," p. 158.

45. Brookes, "Correspondence," p. 274. Wellisch would not be the only critic of Brooke's definition of IS. Saunders in his article ("The Nature of Information Science," p. 63) rejected it as "too all-embracing."

46. E.P. Semenuik, "K nauke informatsii," Nauchnoteknicheskaia informatsiia, Series I, No. 1 (1971) 5-13. Cited from the JPR translation S 3067, UDC: 007:001, "Toward a Science of Information," p. 2. I have changed Semenyuk to Semeniuk to conform to Library of Congress transliteration.

47. Ibid.

48. Ibid., p. 3 The bracketed passage "to be" has been changed from "not only" in the translation, a phrasing that makes no sense.

49. Informatics is the term by which information science is known in the USSR.

50. Semeniuk, "Toward a Science," p. 11. Semeniuk went on to advocate the development of a meta-science which he called informology and of which informatics would be a part.

51. Wellisch, "From Information Science," 1976.

17. See above, p. 6.

18. Gerard Salton, "On the Development of Information Science," Journal of the American Society for Information Science, Vol. 24, No. 3, (May-June, 1973) 218-20, here p. 220.

19. Susan Artandi, "Information Concepts and their Utility," Journal of the American Society for Information Science, Vol. 24, No. 4, (July-August, 1973), 242.

20. Wellisch, "From Information Science," pp. 170-76.

21. Artandi, "Information Concepts," p. 244. Semeniuk would agree. See below, pp. 19-20.

22. Susan Artandi, An Introduction to Computers in Information Science, second edition (Metuchen, N.J.: Scarecrow Press, 1972), p.17.

23. Wellisch, "From Information Science." pp. 159-64.

24. Artandi, An Introduction. p. 17.

25. W.L. Saunders, "The Nature of Information Science," The Information Scientist, Vol. 8, No. 2 (June, 1974), 61.

26. Ibid., p. 65.

27. Ibid. On the next page he pointed to Shannon's theory as his prime piece of evidence for the scientific nature of information science but, as will be seen below, suggesting an important place for this in the theory of IS may be an exercise of questionable value.

28. Ibid., p. 67. Mikhailov et.al. share his belief in the predominantly social science nature of information science.

29. Victor Rosenberg, "The Scientific Premises of Information Science," Journal of the American Society for Information Science, Vol. 25, No. 4 (July-August, 1974), 266. Wellisch had said the same thing in his above cited 1973 paper, pp. 169-70.

30. B.T. Stern, "The Theory of Information Science," The Information Scientist, Vol. 8, No. 4 (December, 1974), 161.

31. Rosenberg, "The Scientific Premises, " p. 264.

32. Ibid., pp. 265 and 266.

33. Ibid., p. 268.

34. James G. Williams and Chai Kim, "On Theory Development in Information Science," Journal of the American Society for Information Science, Vol. 26, No. 1 (January - February, 1975) 3-7.

35. Ibid., p. 7

52. Both quotations from A. I. Mikhailov, A. I. Chernyi, and R. S. Gilyarevskii, "Informatics: Its Scope and Methods" in International Federation for Documentation, Or Theoretical Problems of Informatics, FID 435 (Moscow: All Union Institute for Scientific and Technical Information, 1969). p. 12.

53. Both quotations Ibid., p. 14. It should be pointed out that the adjective used to describe information is nauchnaia . This comes from the Russian noun nauka which can be translated as "science" but also has the broader meanings of "learning" and "knowledge" and "scholarship."

54. Ibid., p. 15.

55. Ibid. , pp. 16-22.

56. D. J. Foskett, "Informatics," Journal of Documentation, Vol. 26. No. 4, (December, 1970) 340-45.

57. Wellisch, "From Information Science," p. 186.

58. Nicholas J. Belkin, "Some Soviet Concepts of Information for Information Science," Journal of the American Society for Information Science, Vol. 26, No. 1 (January-February, 1975) 56-64. Perhaps the lack of impact of FID 435 has something to do with its physical scarcity. Only a thousand copies were printed--a very small printing for a book published in the Soviet Union. The NUC lists only two locations for it in North America.

59. Wellisch, "From Information Science," p. 178.